Calculating the Cost of Equity for Water Utility Companies

ROTHSCHILD FINANCIAL CONSULTING

NASUCA WATER COMMITTEE SPEAKER MEETING

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MARCH 9, 2023

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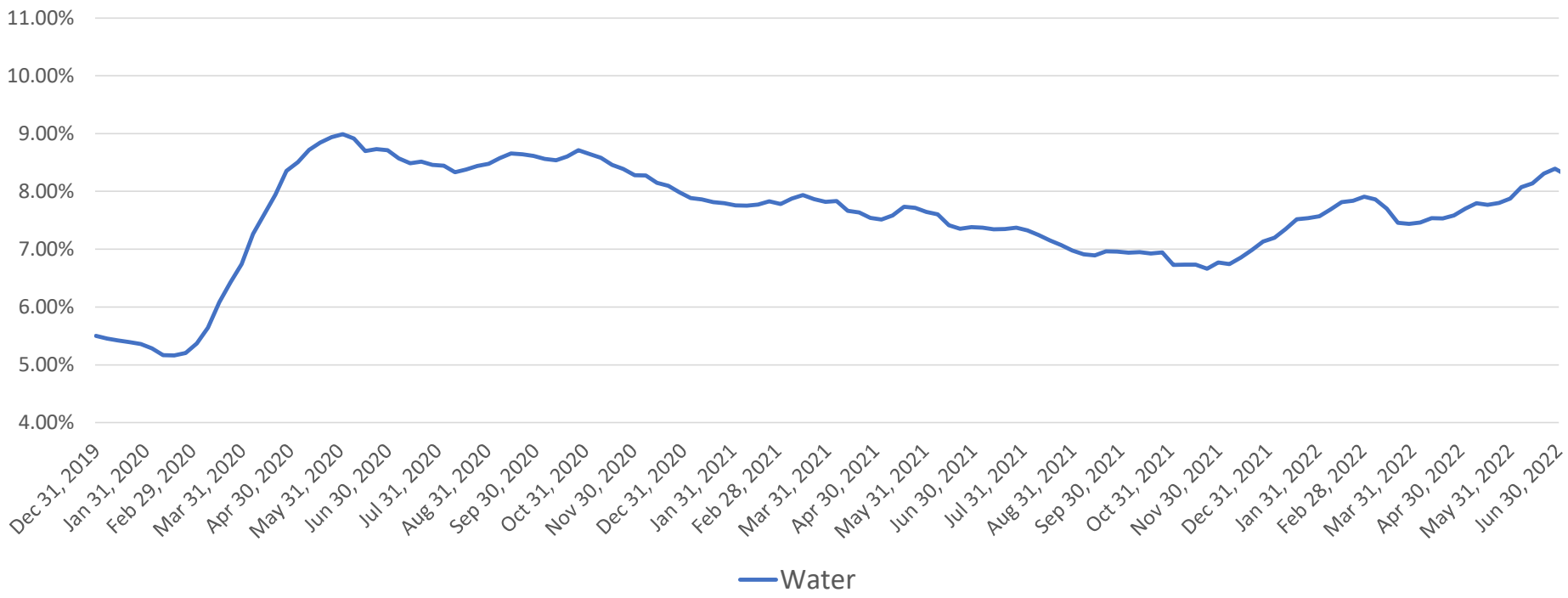
What is new since our last presentation in July 2022?

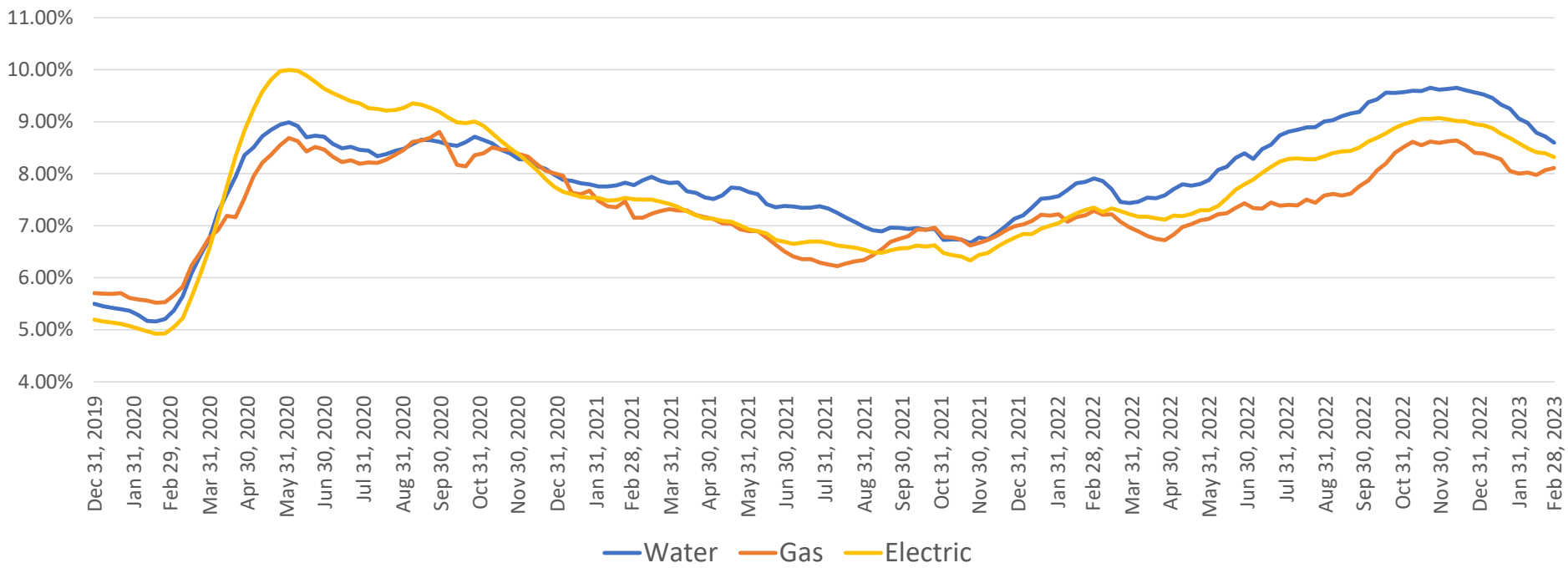
- Capital Markets have continued to evolve, so we are providing updates on all metrics through February 2023
- We have recently added a new dimension to our analysis, which measures the COE over different time horizons (COE Term Structure)
  - This is valuable because it allows us to interpret how investors expect the COE to change over time



Is the Cost of Equity for regulated water utilities increasing or decreasing?

Is the Cost of Equity for regulated water utilities increasing or decreasing?

- Utilities argue that high inflation and increasing interest rates translate into an increasing COE.
- But neither high inflation nor increasing interest rates necessarily mean an increasing COE.
- There are other critical factors that play a role in the calculation of COE:
  - Market volatility
  - Investor Risk Aversion (Flight-to-quality)
  - Beta (Correlation to market movements)



Cost of Equity for Water, Gas, and Electric Utility Companies

What Is the Cost of Equity?

- "The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks." – *U.S. Supreme Court, Fed. Power Comm'n v. Hope Nat. Gas Co., 320 U.S. 591, 603 (1944)*
- The Cost of Equity of an investment is the return investors expect when making investments with a comparable risk profile.
- There are different ways to calculate it, most of them very old
- Today we will show you a relatively new market-based approach that we have been using successfully for the last six years that we hope you will find very interesting

Is Finance / Cost of Equity a Science?

Science

- Formulates laws about observable behavior. Describes how the universe works. Seeks to discover the fundamental principles that describe the world.
- Newton's laws allow us to send rockets to the moon. Maxwell's equations allow us to build radar, electric motors, and power generation.

Finance

- "Physics envy" – many want it to be a practical field like physics or electrical engineering
- Uses calculus, statistics, stochastic processes, and Brownian motion
- But in finance we do not have the laws to use an axiomatic approach
- Cost of Equity is largely about the relation between risk and expected return

If Finance / Cost of Equity Is Not A Hard Science, Does This Mean It Is Art?

IF IT IS ART…

- Excuse to say anything goes.
- You have your opinion, I have mine. There is no way to tell which is any better. Let's take the average of the two. This leads to overcharging consumers.

BUT THE COST OF EQUITY IS OBJECTIVELY MEASURABLE

IT IS SCIENCE, but not as straightforward as measuring the mass of an object

- Complexity – measuring the average temp of ocean
- Reflexivity / Human Uncertainty Principle – humans / not molecules
- Models are Tools – Modelers' Manifesto
- Long-Term Capital Market's Failure – too much faith in models

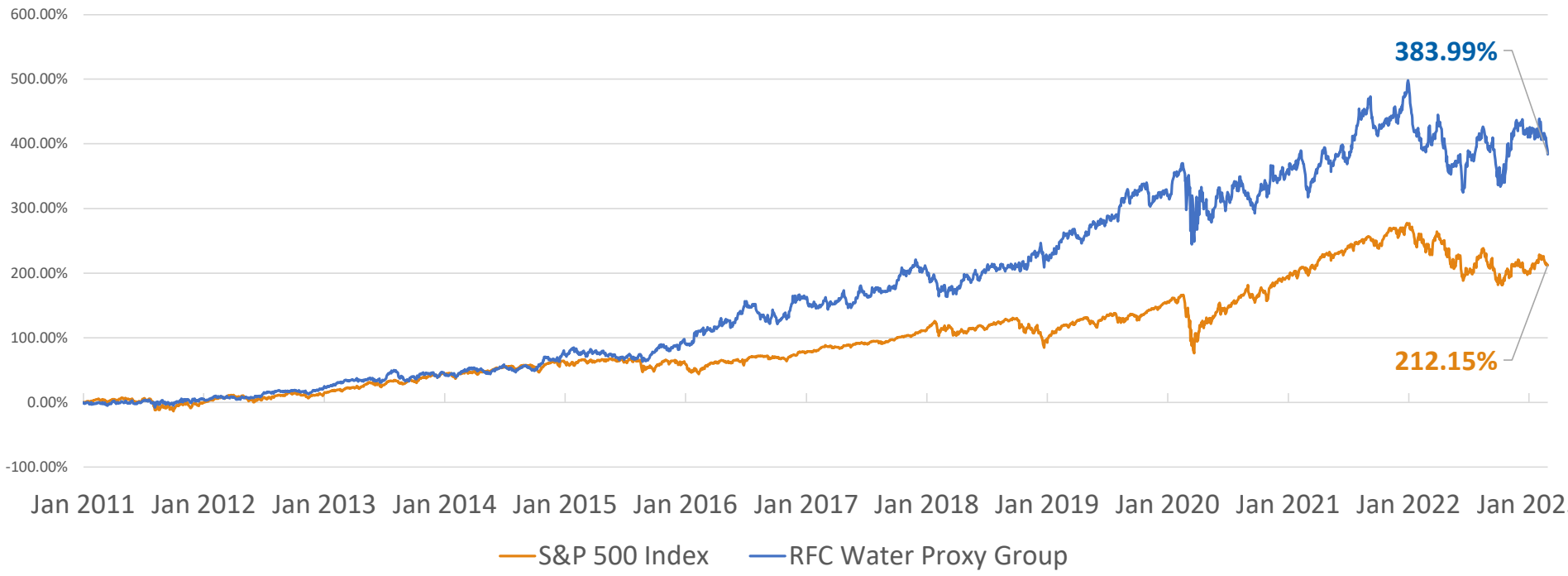
Cost of Equity Should Be Market-Based

- "The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks." – *U.S. Supreme Court, Fed. Power Comm'n v. Hope Nat. Gas Co., 320 U.S. 591, 603 (1944)*
- ROE must be "…sufficient to…support its credit and…raise the money necessary for the proper discharge of its public duties." -- *Bluefield Water Works & Improvement Co. v. Pub. Serv. Comm'n of the State of W. Va. 262 U.S. 679, 692-693 (1923)*
- Investors are the ones providing capital to utility companies in capital markets, not analysts or economists
- If cost of equity is not market-based, utilities may not be able to raise the funds they need to provide safe and reliable service – or consumers may be overcharged
- The market-based cost of equity should be a guiding post in setting authorized ROEs
- Many are familiar and agree with all of this in theory, but….

In Practice, Are Authorized ROEs Based on Market-Based Cost of Equity?

- Economist interest rate forecasts are NOT market-based
- Analyst earnings per share growth estimates are NOT market-based
- Authorized ROEs in previous proceedings, even if we assume they were market-based at the time they were set, may NOT be a proper indication of current market conditions
- Value Line 5-Year Historical Betas, which are published quarterly and can be several months out of date are based on market data, but are backward looking and often stale
- So how do you calculate a truly market-based Cost of Equity?
- Markets provide a great wealth of data…

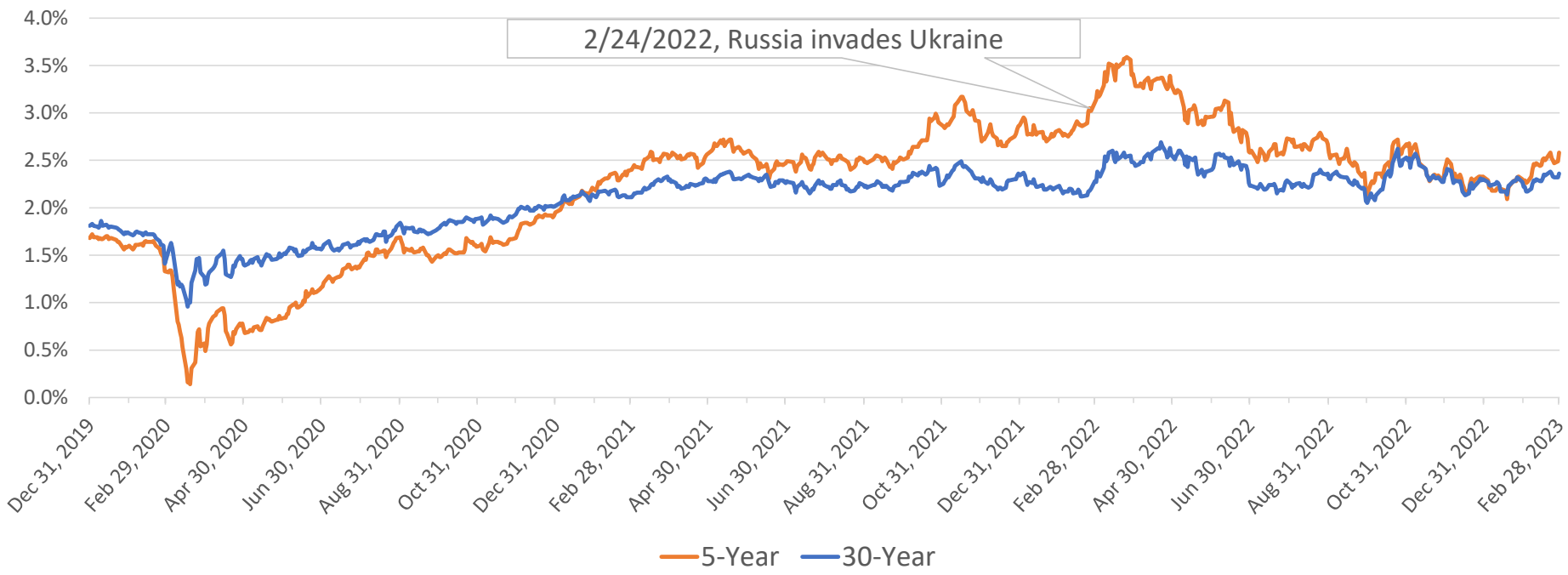
S&P 500 Index Performance



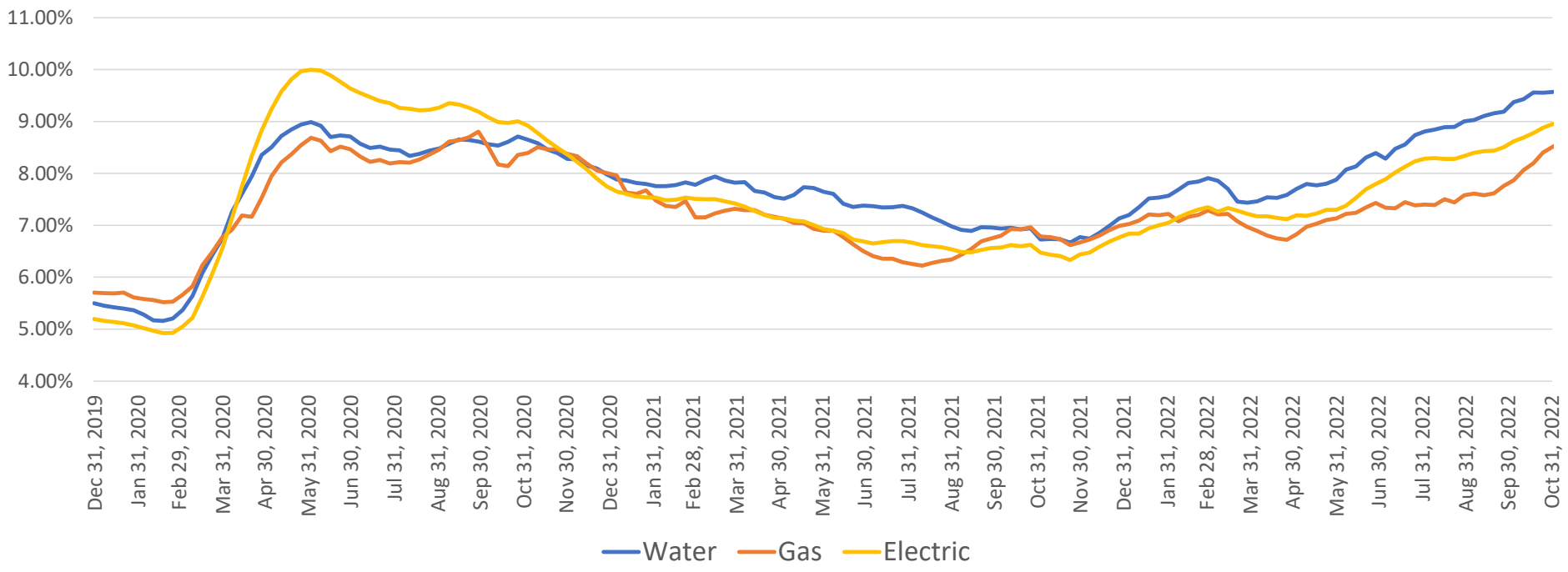
S&P 500 Index vs Water Utility Stocks

What Are The Most Important Factors Related to the Cost of Equity Now?

- COVID, War in Ukraine have had significant capital market impacts:
  - Inflation
  - Interest rates (FED is raising the federal funds rate to fight inflation)
  - Stock price volatility
  - Possibility of a recession
- The market-based Cost of Equity already takes these factors into consideration

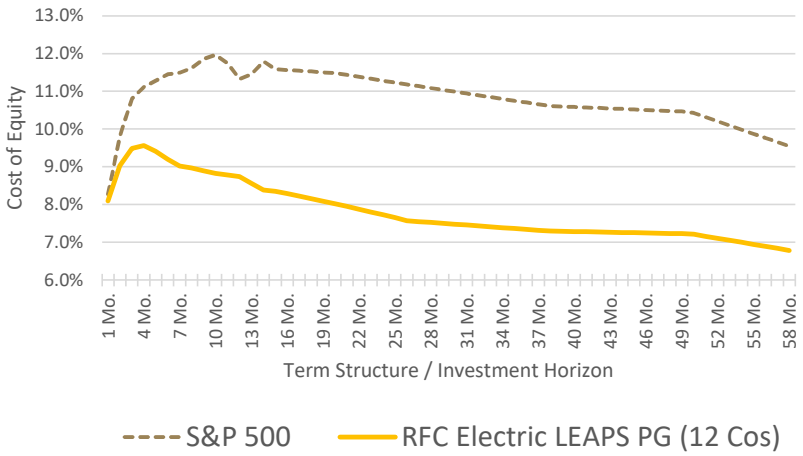


Investor Inflation Expectations



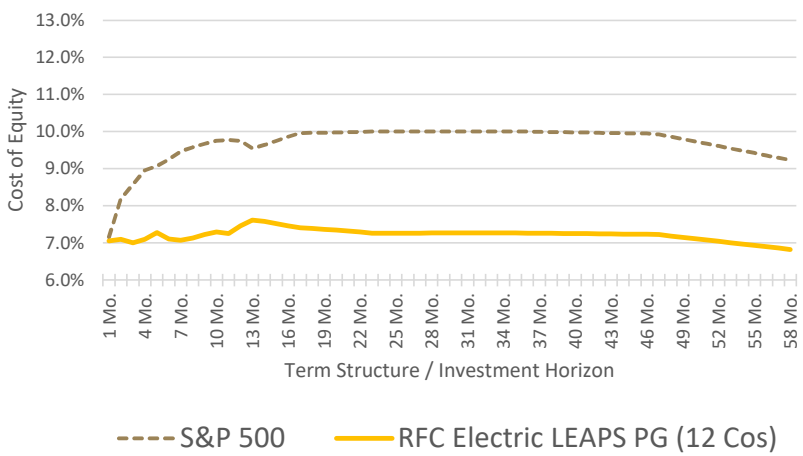
Cost of Equity for Water, Gas, and Electric Utility Companies

October 2022



* Electric Company beta coefficients held flat from 26 to 58 months.

January 2023



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Term Structure of COE

S&P 500 and RFC Electric LEAPS Proxy Group

Aaron and Edgar Have Been Building Financial Models for Decades

- After graduating from Vanderbilt University in 1996, Aaron Rothschild built financial models to evaluate investments in fiber optic expansion projects for Metropolitan Fiber Systems (MFS), 360 Networks, and WorldCom in the U.S. and Asia Pacific after the Telecom Act of 1996 opened the market to competition.
- After graduating from Harvard University in 1998, Edgar Bandera worked on Wall Street, where he built financial models to evaluate mergers, acquisitions, and other investment decisions at Deutsche Bank. He has been building financial models ever since, including having trained hundreds of investment bankers in model building best practices.
- Common pitfall is that models are often used to justify decisions that have already been made.
- There are numerous ways to model even relatively simple investment decisions.

Models Used By Investors

- Black-Scholes Option Pricing Formula (with and without known dividends)
- Binomial Option Pricing Model
- Binomial Option Pricing Model with Skewness and Kurtosis
- Trinomial Trees
- Monte Carlo Simulation
- Hidden Markov Model (Renaissance Technologies famous for using)
- Machine Learning (e.g., making trades based on tweets of influential people)
- Back Pain (George Soros used to make trades, in part, when he felt a pain in his back)
- Jealousy Model – "I must buy this stock because my friend just made a lot of money in the market"
- **Countless More…**

COE Models Most Commonly Used in Regulatory Proceedings

- Discounted Cash Flow (DCF)
- Capital Asset Pricing Model (CAPM)
- Risk Premium Method

CAPM Formula

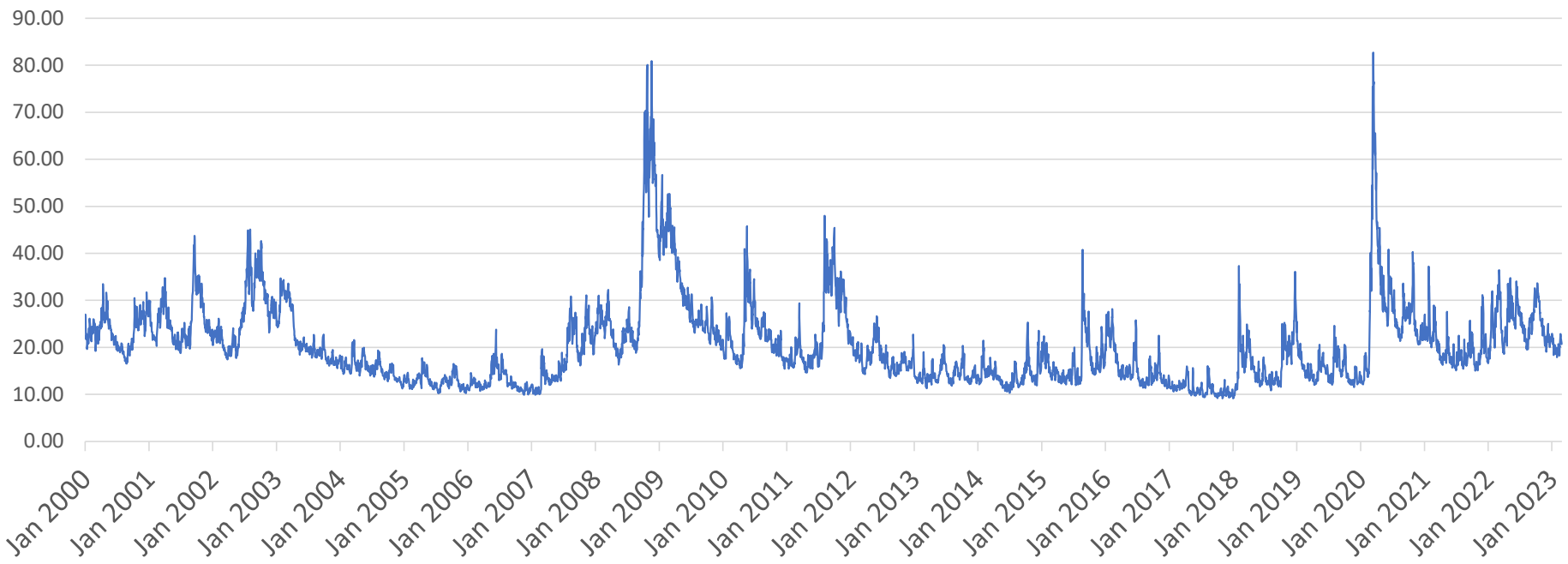
$$K = Rf + \beta i * [Rm - Rf]$$

Where:

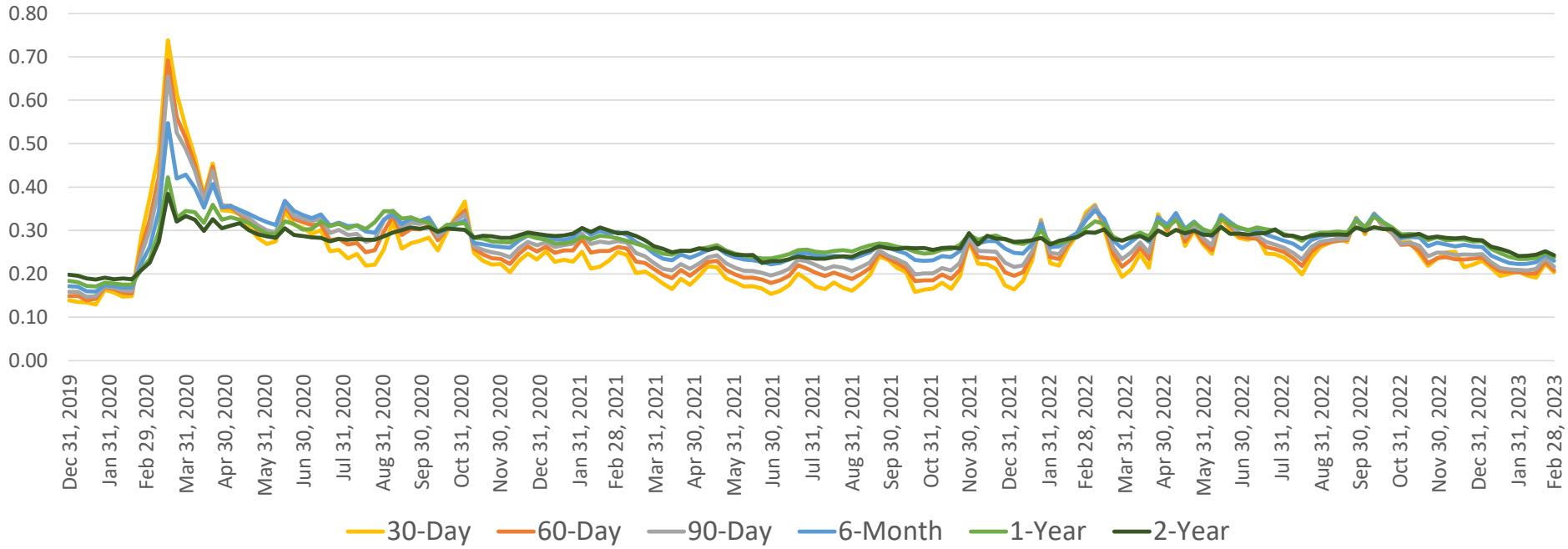
- K is the cost of equity;
- Rf is the risk-free interest rate;
- Rm is the expected return on the overall market (e.g., S&P 500);
- [Rm – Rf] is the premium investors expect to earn above the risk-free rate for investing in the overall market ("equity risk premium" or "market risk premium"); and
- βí (Beta) is a measure of non-diversifiable, or systematic, risk.

Stock Options Provide A Direct Measure of Investor Expectations

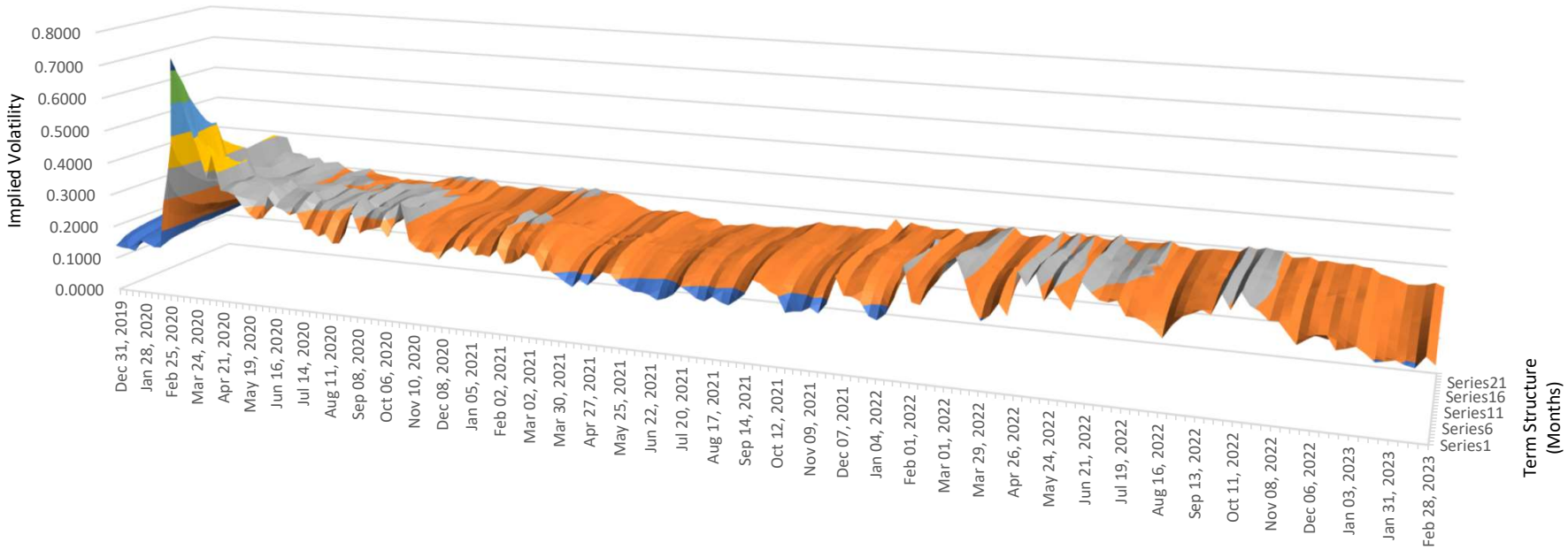
- Authorized ROE should be based on a forward-looking and market-based estimate of the cost of equity
- Many witnesses use backward-looking measures such as historical betas and historical risk premiums – these are arguably market-based, but backward looking.
- Others use so-called forward-looking measures such as equity analyst forecasts and interest rate forecasts – but these are not market-based.
- Stock options provide a great deal of information regarding investors' expectations – these are both forward-looking and market-based.



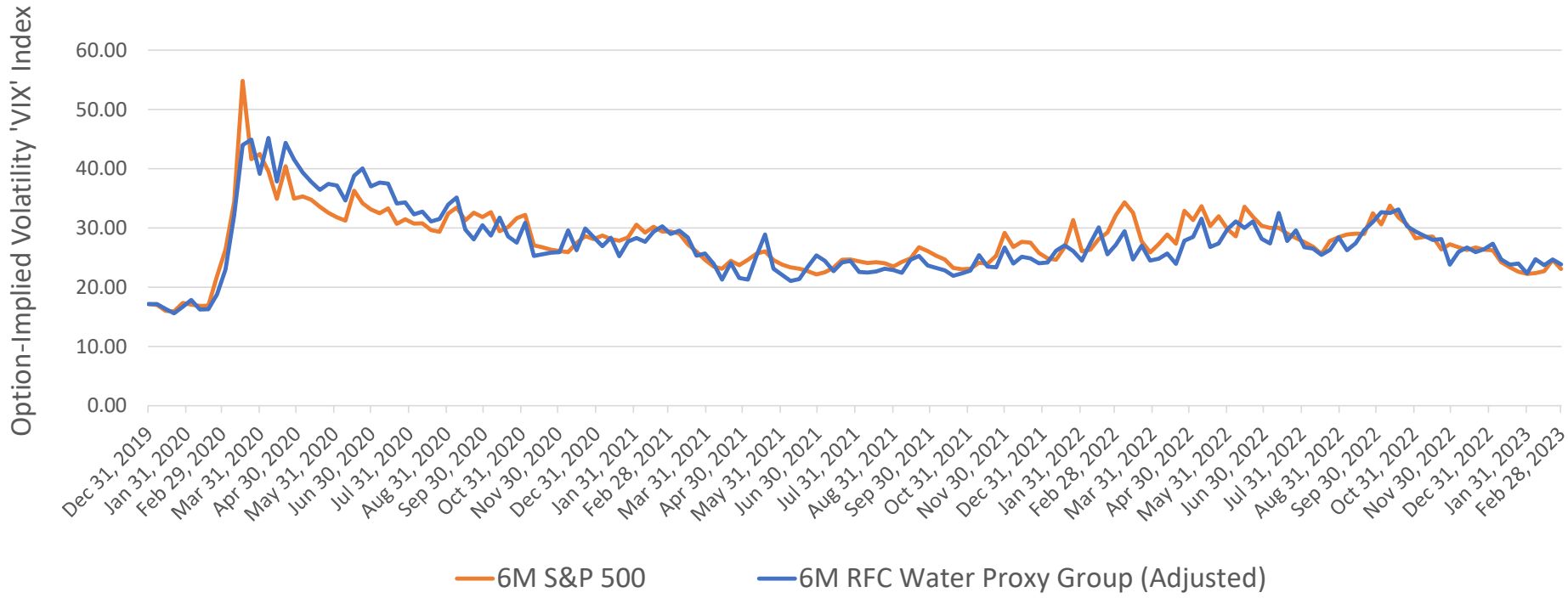
CBOE VIX Index – “Fear Index”



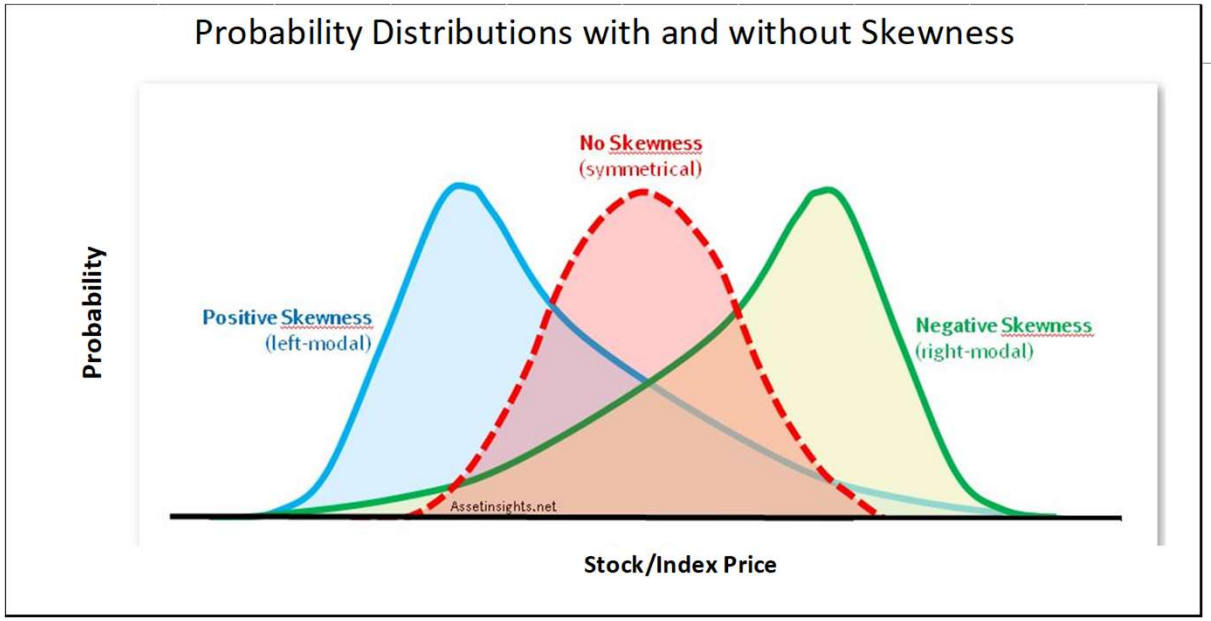
S&P 500 Option-Implied Volatility



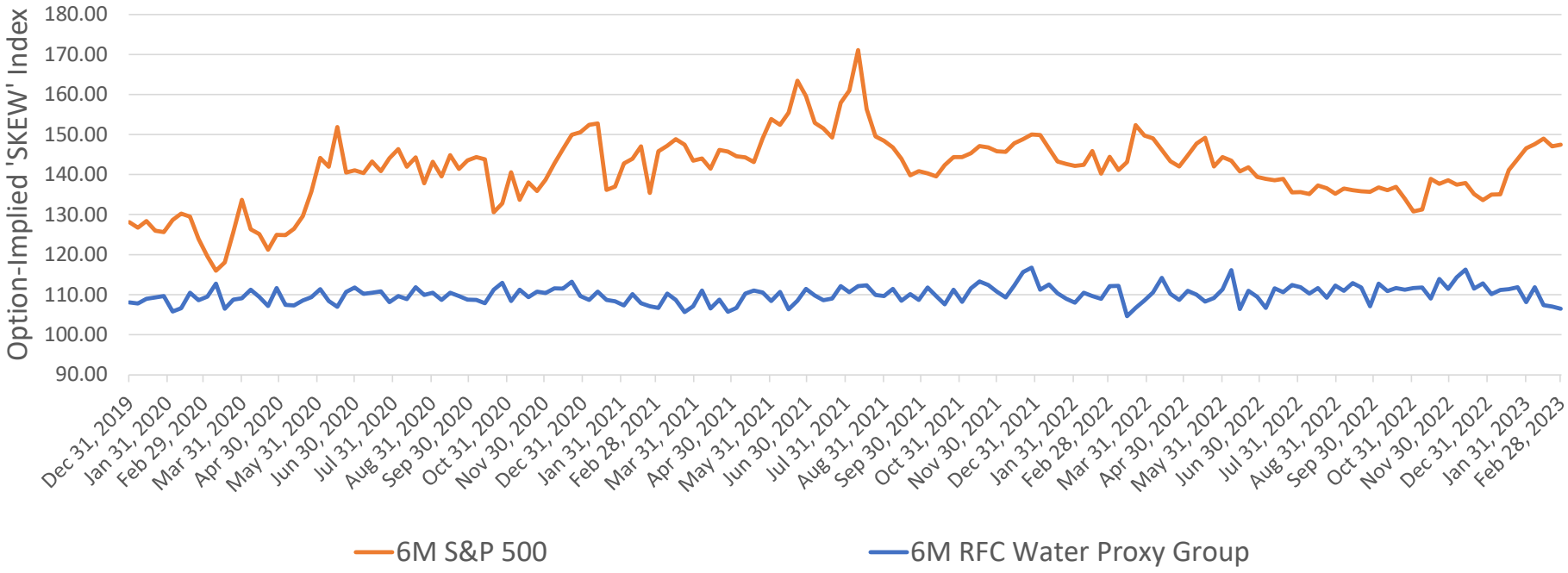
S&P 500 Option-Implied Volatility Surface



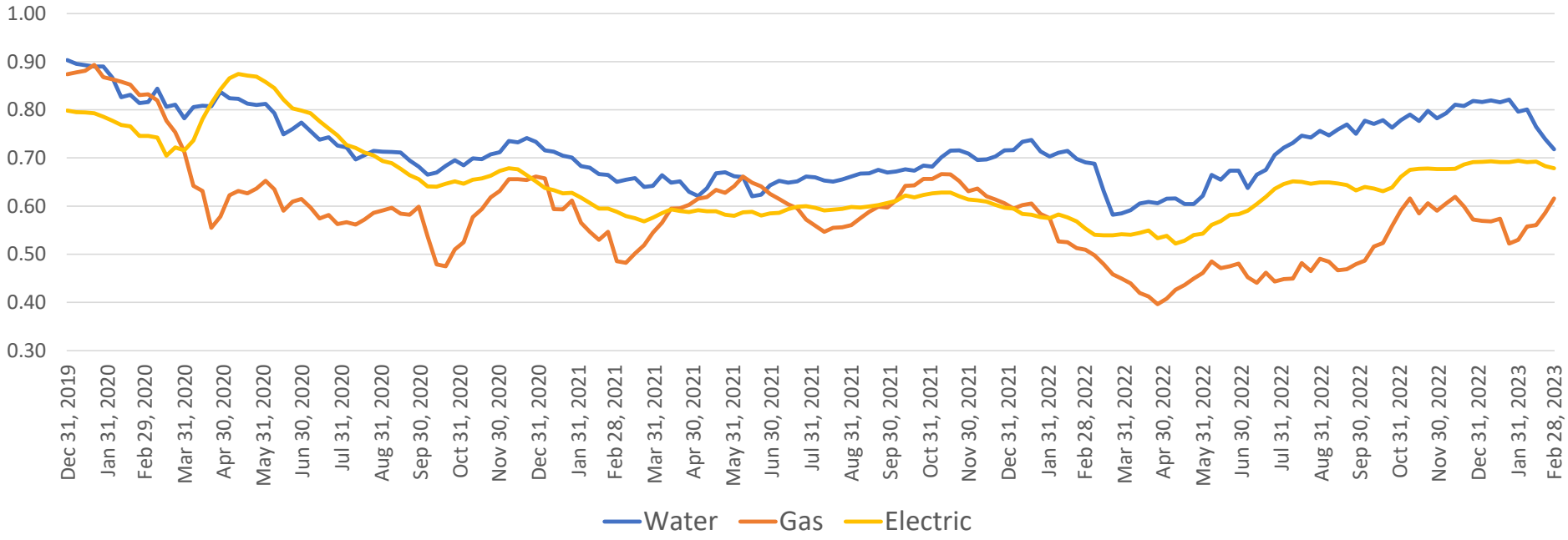
VIX Index Equivalent for Water Utility Companies



Definition of Skewness



SKEW Index Equivalent for Water Utility Companies



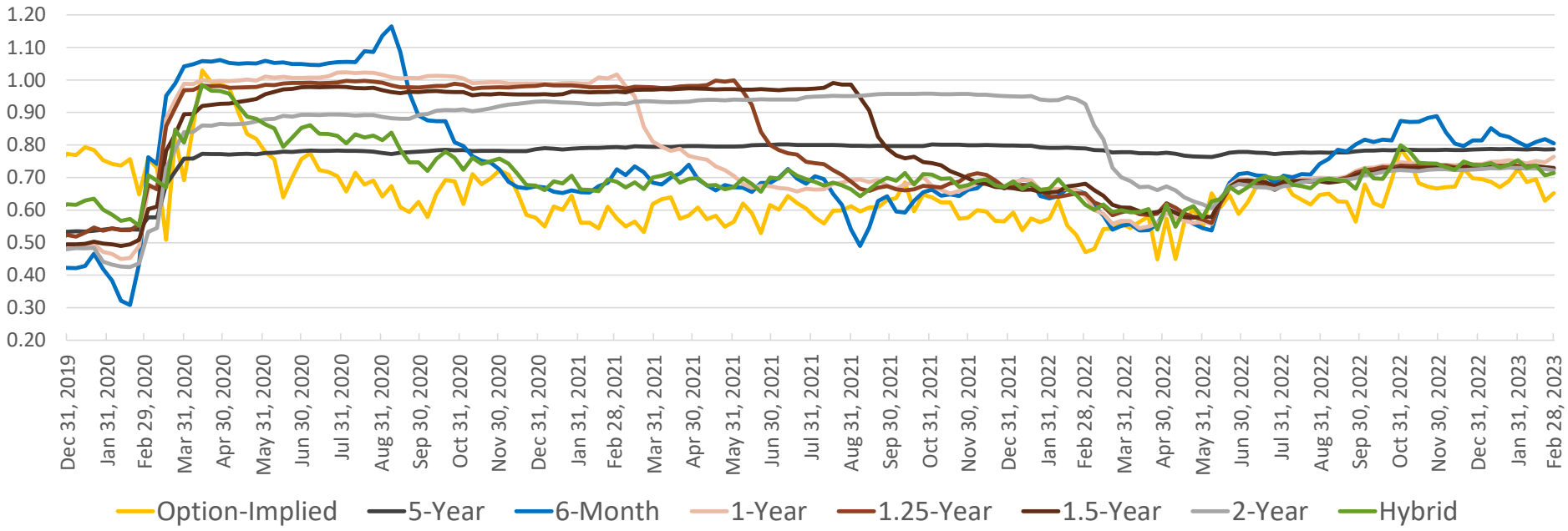
Option-Implied Betas for Utility Companies (3-Month Weighted Average)

RFC Option-Implied Methodology

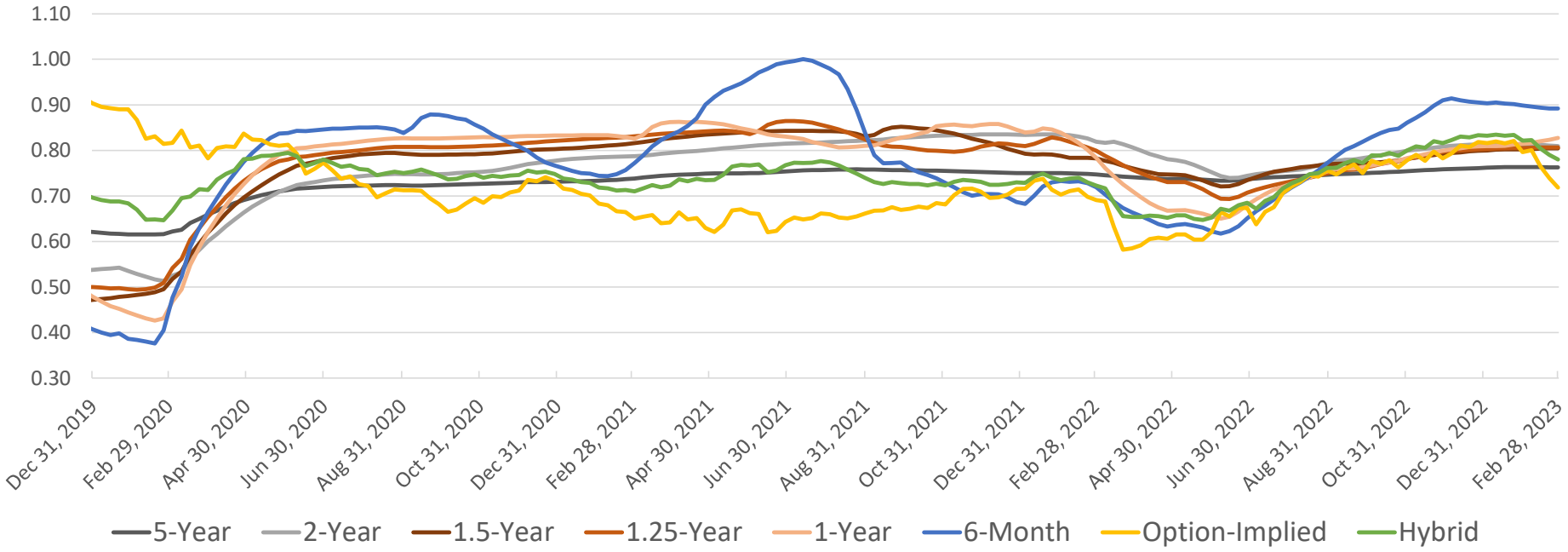
- Based on established methodologies (i.e., CBOE, peer reviewed papers)
- Has successfully withstood ample scrutiny in both written form and on the witness stand
- RFC has used this methodology in roughly thirty proceedings in seven states over the past 6 years
  - RFC 7.46% ROE recommendation adopted for Blue Granite Water Company in decision by the Public Service Commission of South Carolina in April 2020 and upheld by South Carolina Supreme Court in September 2021
  - "The Authority finds Rothschild's market-based approach for determining a reasonable ROE to be credible and persuasive… Therefore, …the Authority shall consider a similar approach to incorporating investor expectations into the historically applied DCF and CAPM methodologies in all future rate proceedings." – Connecticut Public Utility Regulatory Authority, September 2021
  - RFC has used this methodology in negotiations in several cases before FERC
  - RFC is collaborating with NASUCA members in CA, PA, and SC in ongoing proceedings

Goal Is To Up The Game and Bring In Constructive Criticism

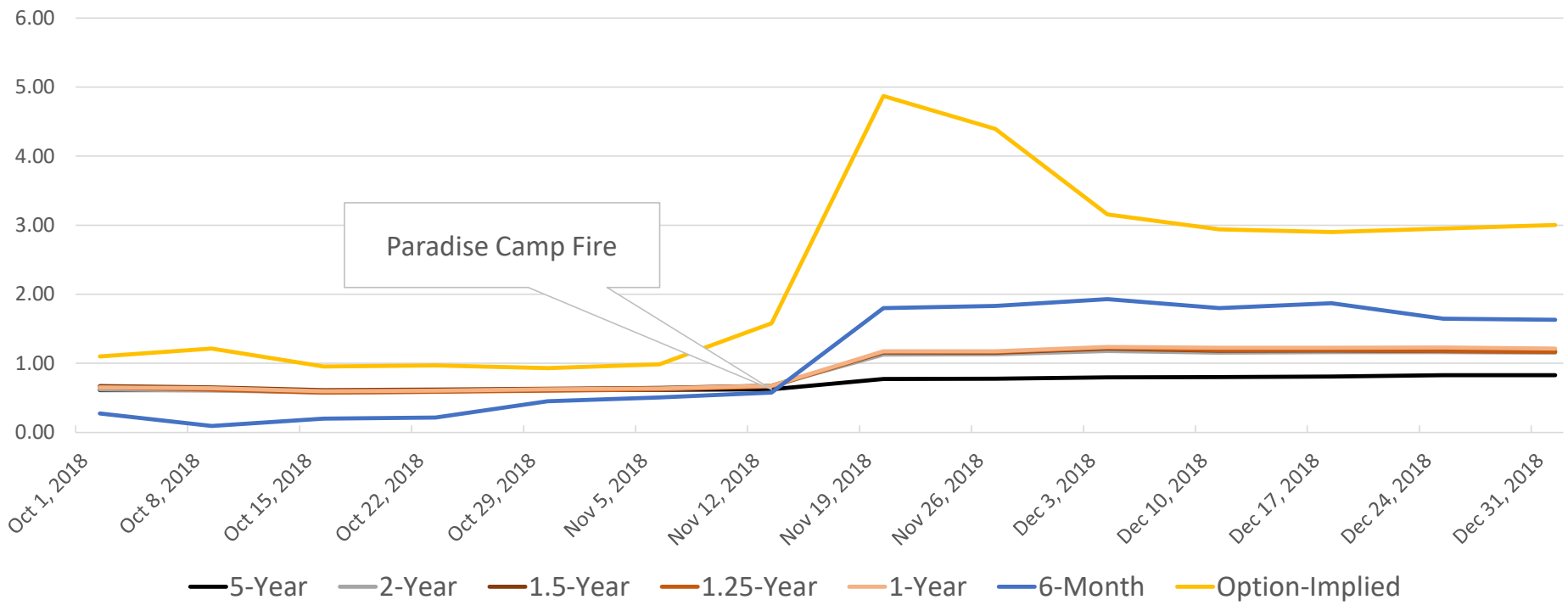
- Knowledge creation requires exposure to criticism and the willingness to change / improve
- But the quality of the criticism matters – examples of poor criticisms:
  - Utility witnesses openly promoting flawed methods because they've been used for a long time
  - Utility witnesses claiming that a method is flawed if it changes
  - Comparing results to previously authorized returns makes it impossible to adjust to changing market conditions
  - Using fear without foundation
  - Making statements without justification



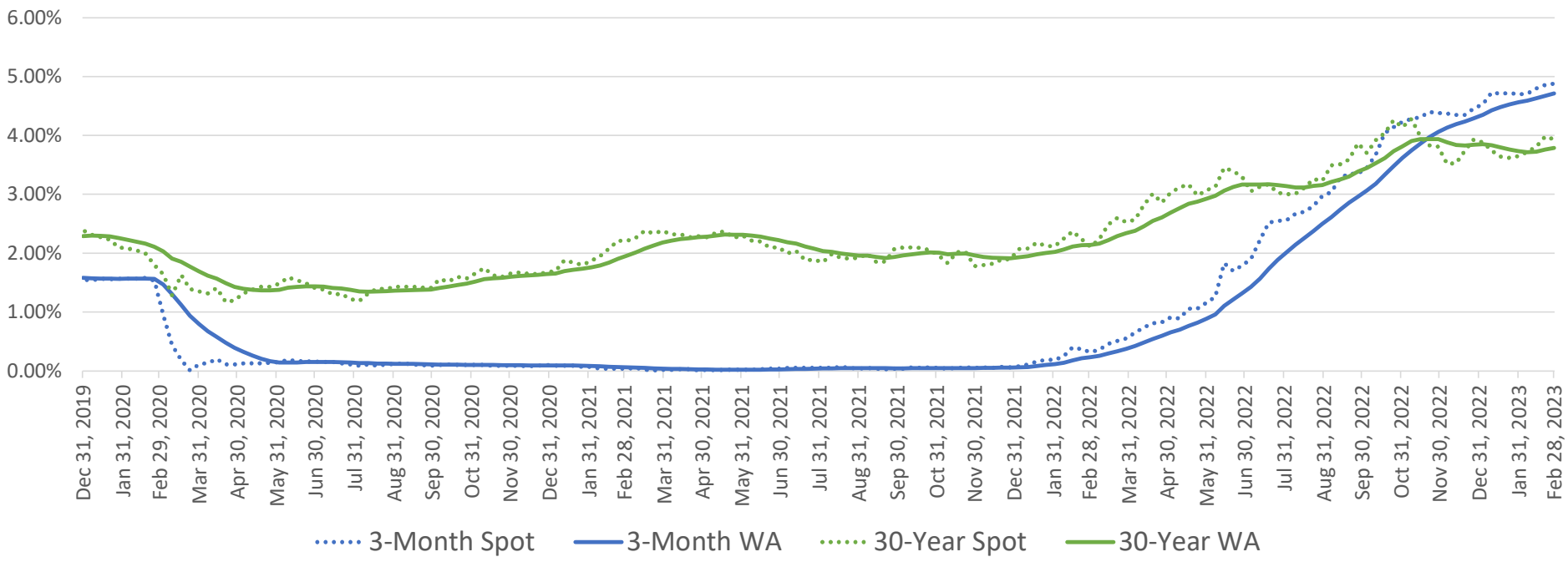
Option-Implied Betas vs Historical Betas
Electric Utility Companies (Spot Weekly Values)



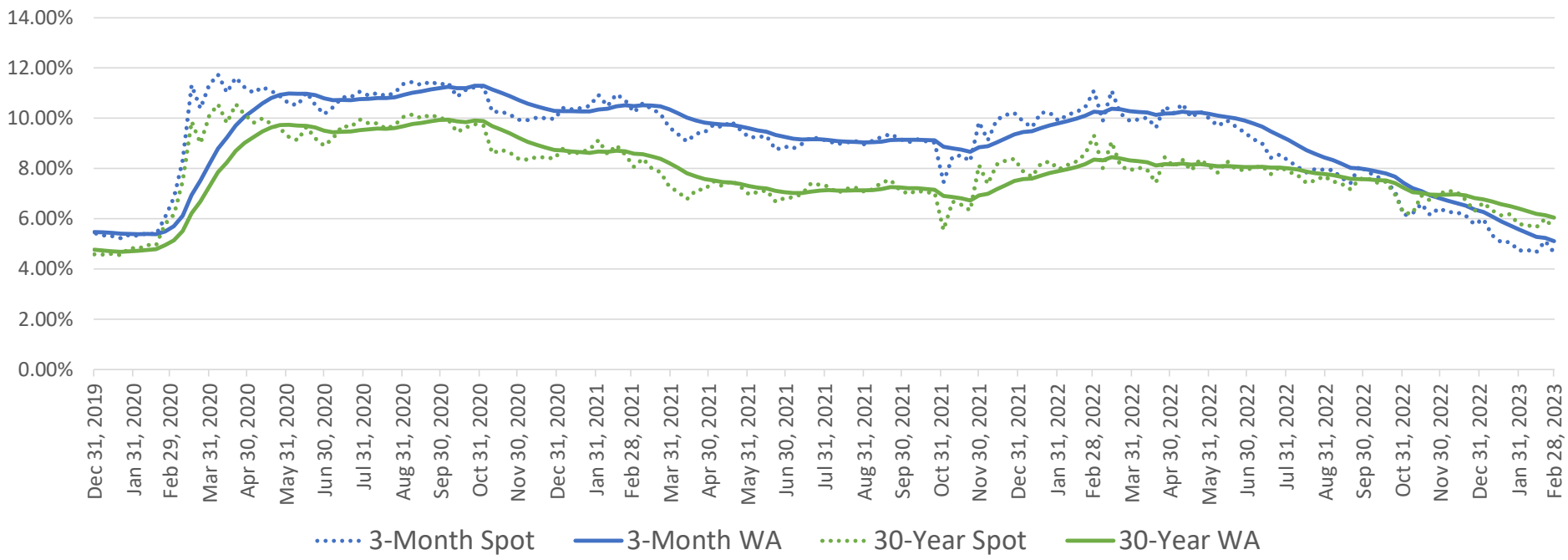
Option-Implied Betas vs Historical Betas
Water Utility Companies (3-Month Weighted Average)



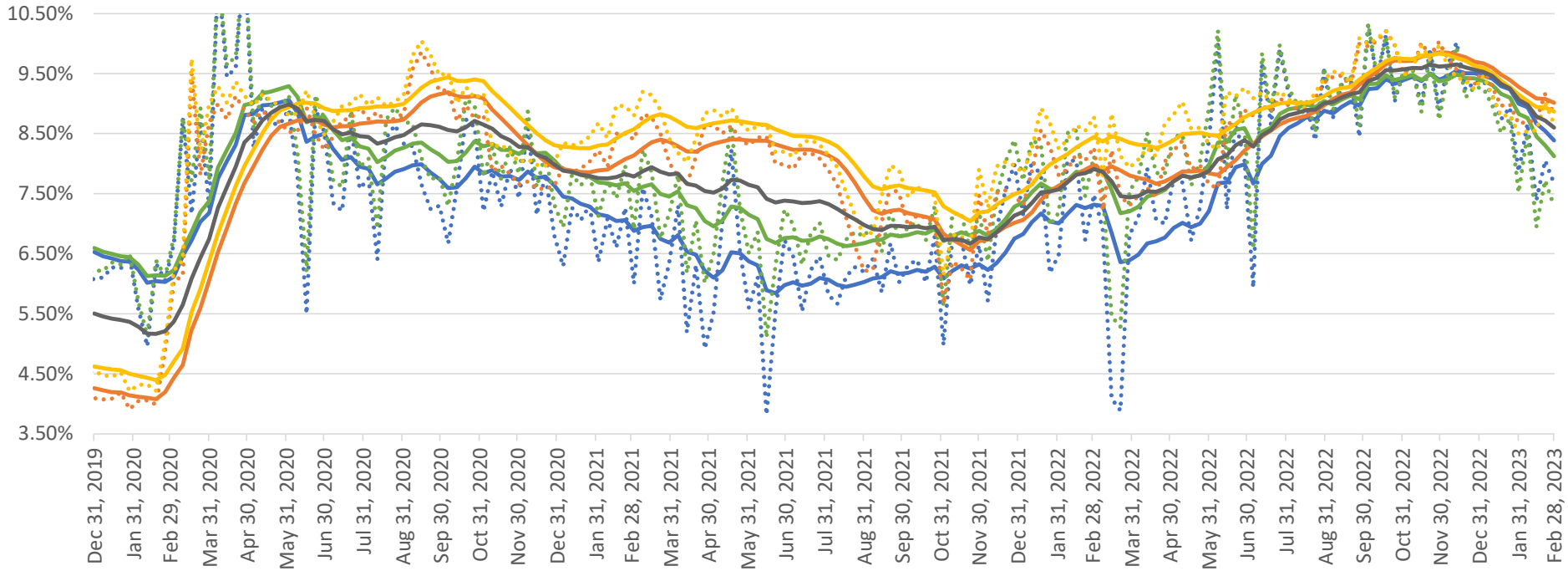
PG&E Betas Before and After 2018 Paradise Camp Fire



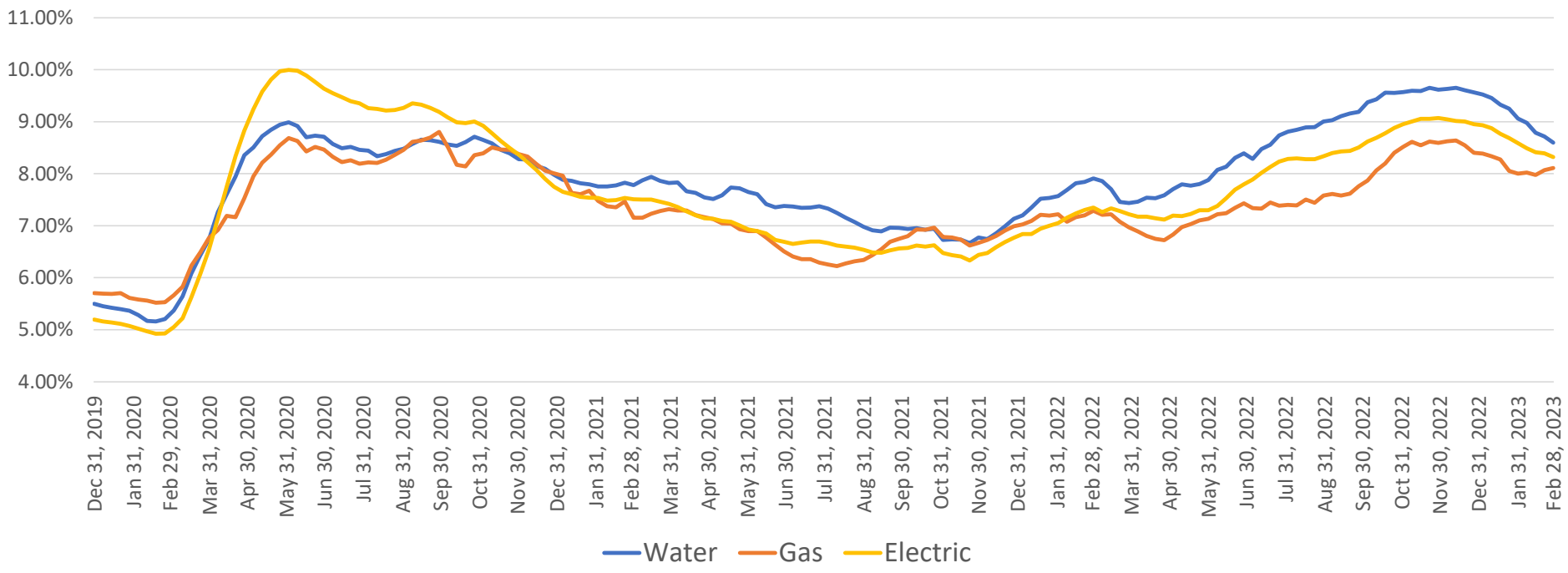
Risk-Free Rate



Market Risk Premium



Cost of Equity for Water Utility Companies



Cost of Equity for Water, Gas, and Electric Utility Companies

Thank you for your time!

- Questions?
- Please contact us for further discussion or for monthly access to weekly regulated utility data:
  - Option-implied betas, volatility, and skewness
  - Properly calculated historical betas from 6 months to 5 years
  - Estimated Cost of Equity

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